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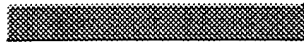
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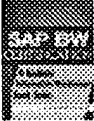





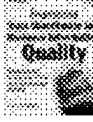
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### General Information

In general, an organization is started to earn money by selling a product or by providing service to the product. An organization may be at one place or may have several branches.

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When we consider an example of an organization selling products throughout the world, the main four major dimensions are product, location, time and organization. Dimension tables have been explained in detail under the section [Dimensions](#). With this example, we will try to provide detailed explanation about STAR SCHEMA.

### What is Star Schema?

Star Schema is a relational database schema for representing multidimensional data. It is the simplest form of data warehouse schema that contains one or more dimensions and fact tables. It is called a star schema because the entity-relationship diagram between dimensions and fact tables resembles a star where one fact table is connected to multiple dimensions. The center of the star schema consists of a large fact table and it points towards the dimension tables. The advantage of star schema are slicing down, performance increase and easy understanding of data.

#### Steps in designing Star Schema

- Identify a business process for analysis(like sales).
- Identify measures or facts (sales dollar).
- Identify dimensions for facts(product dimension, location dimension, time dimension, organization dimension).
- List the columns that describe each dimension.(region name, branch name, region name).
- Determine the lowest level of summary in a fact table(sales dollar).

### Important aspects of Star Schema & Snow Flake Schema

- In a star schema every dimension will have a primary key.
- In a star schema, a dimension table will not have any parent table.
- Whereas in a snow flake schema, a dimension table will have one or more parent tables.
- Hierarchies for the dimensions are stored in the dimensional table itself in star schema.
- Whereas hierachies are broken into separate tables in snow flake schema. These hierachies helps to drill down the data from topmost hierachies to the lowermost hierarchies.

### Glossary:

#### Hierarchy

A logical structure that uses ordered levels as a means of organizing data. A hierarchy can be used to define data aggregation; for example, in a time dimension, a hierarchy might be used to aggregate data from the Month level to the Quarter level, from the Quarter level to the Year level. A hierarchy can also be used to define a navigational drill path, regardless of whether the levels in the hierarchy represent aggregated totals or not.

#### Level

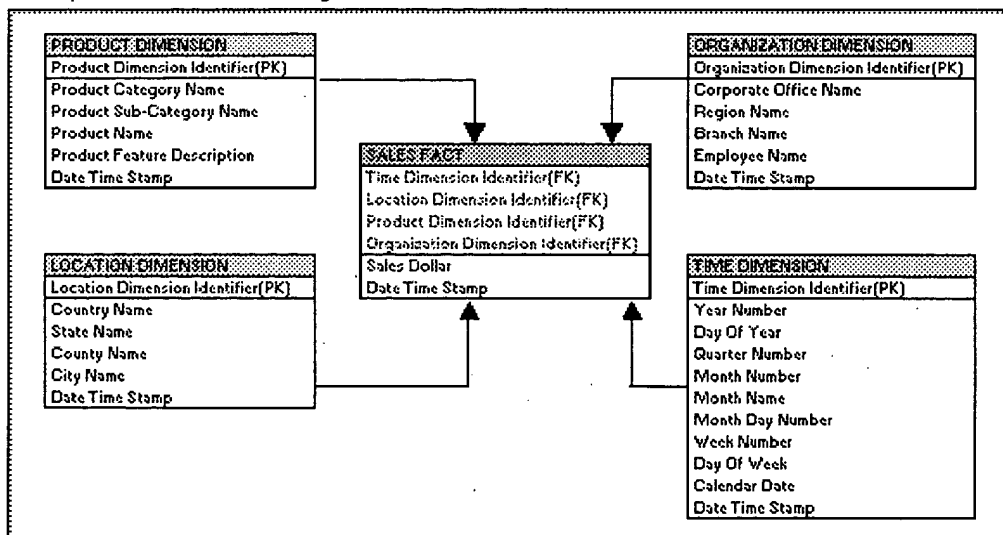
A position in a hierarchy. For example, a time dimension might have a hierarchy that represents data at the Month, Quarter, and Year levels.

#### Fact Table

A table in a star schema that contains facts and connected to dimensions. A fact table typically has two types of columns: those that contain facts and those that are foreign keys to dimension tables. The primary key of a fact table is usually a composite key that is made up of all of its foreign keys.

A fact table might contain either detail level facts or facts that have been aggregated (fact tables that contain aggregated facts are often instead called summary tables). A fact table usually contains facts with the same level of aggregation.

Example of Star Schema: Figure 1.6



In the example figure 1.6, sales fact table is connected to dimensions location, product, time and organization. It shows that data can be sliced across all dimensions and again it is possible for the data to be aggregated across multiple dimensions. "Sales Dollar" in sales fact table can be calculated across all dimensions independently or in a combined manner

which is explained below.

- Sales Dollar value for a particular product
- Sales Dollar value for a product in a location
- Sales Dollar value for a product in a year within a location
- Sales Dollar value for a product in a year within a location sold or serviced by an employee

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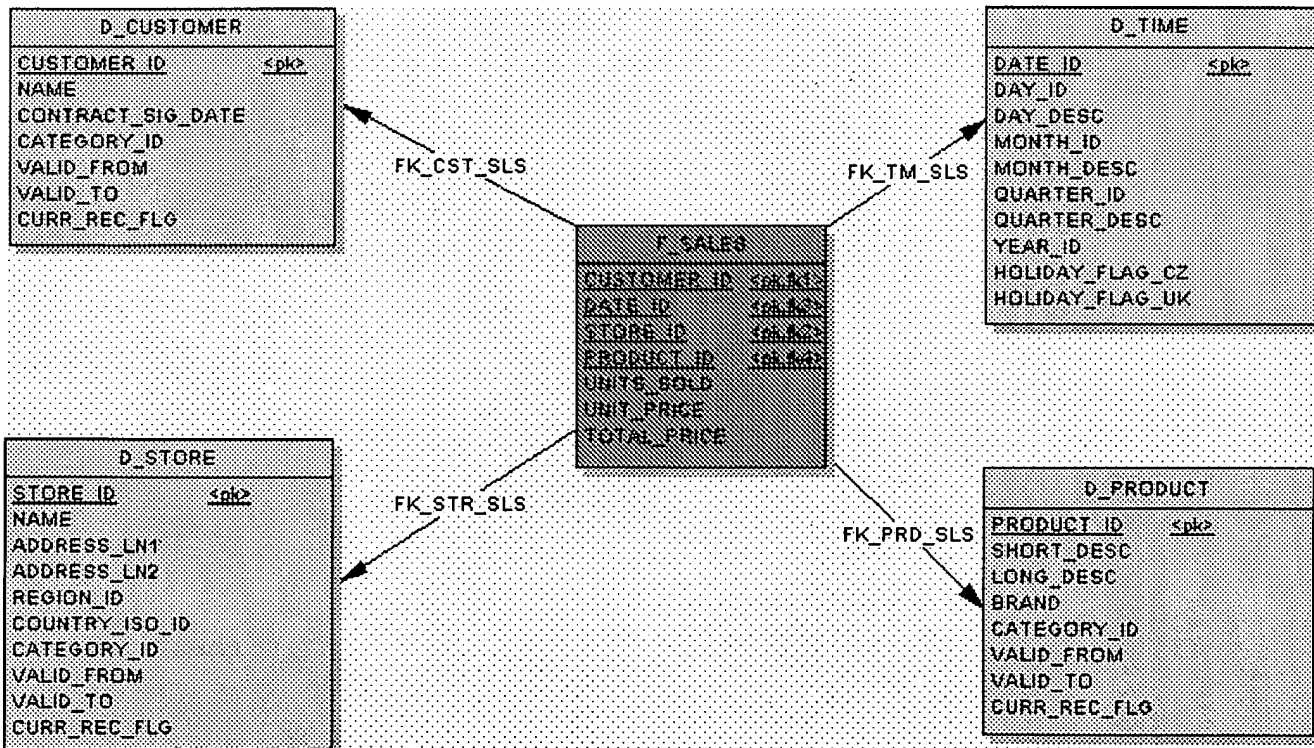
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The **star schema** (sometimes referenced as star join schema) is the simplest data warehouse schema where a single "fact table" containing a compound primary key, with one segment for each "dimension" and additional columns of additive, numeric facts.

The star schema makes multi-dimensional database(MDDB) possible within relational database. Because relational database is the basic data management system in most organization today, it is very appealing that multi-dimensional view of data is implemented in relational database. Even if you are using a specific MDDB solution, its sources are relational databases. Another reason for using star schema is its ease of understanding. Fact tables in star schema is mostly in 3NF, but dimensional tables in de-normalized 2NF. If you want to normalize dimensional tables, they look like snowflakes and the same problems of relational database arise - you need complex queries and business users cannot easily understand the meaning of data. Although query performance may be improved by advanced DBMS technology and hardware, highly normalized tables make reporting difficult and application complex.



## Example SQL

```
SELECT
  sum (f_sales.units_sold)
FROM
  f_sales, d_customer, d_time, d_store, d_product
WHERE
  f_sales.customer_id = d_customer.customer_id and
  f_sales.date_id = d_time.date_id and
  f_sales.store_id = d_store.store_id and
  f_sales.product_id = d_product.product_id and
  d_time.year_id = 1997 and
  d_product.category_id = "tv"
GROUP BY
  d_product.brand
GROUP BY
  d_store.country_iso_id
```

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## Fact Table

The centralized table in a star schema is called as FACT table. A fact table typically has two types of columns: those that contain facts and those that are foreign keys to dimension tables. The primary key of a fact table is usually a composite key that is made up of all of its foreign keys.

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In the example fig 1.6 "Sales Dollar" is a fact(measure) and it can be added across several dimensions. Fact tables store different types of measures like additive, non additive and semi additive measures.

### Measure Types

- Additive - Measures that can be added across all dimensions.
- Non Additive - Measures that cannot be added across all dimensions.
- Semi Additive - Measures that can be added across few dimensions and not with others.

A fact table might contain either detail level facts or facts that have been aggregated (fact tables that contain aggregated facts are often instead called summary tables).

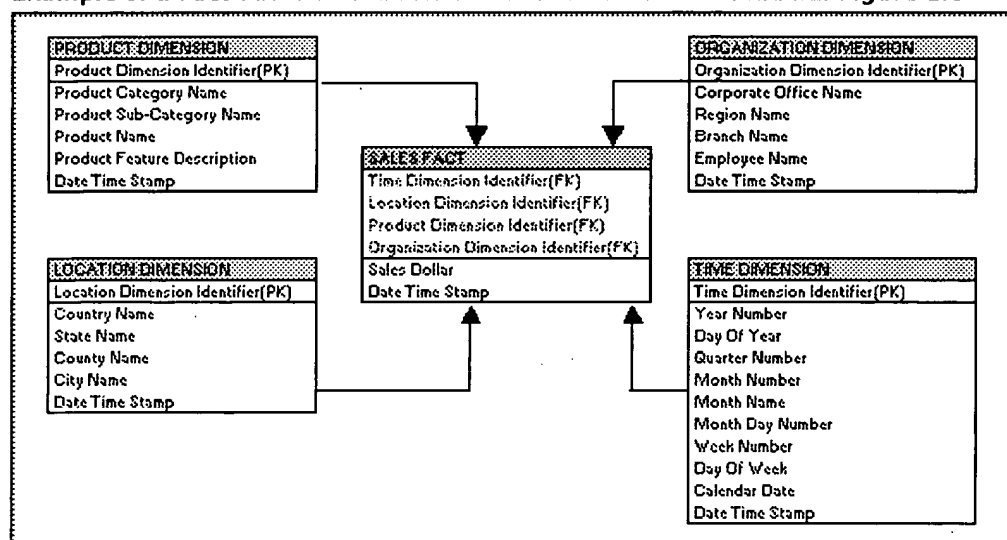
In the real world, it is possible to have a fact table that contains no measures or facts. These tables are called as **Factless Fact** tables.

### Steps in designing Fact Table

- Identify a business process for analysis(like sales).
- Identify measures or facts (sales dollar).

- Identify dimensions for facts(product dimension, location dimension, time dimension, organization dimension).
- List the columns that describe each dimension.(region name, branch name, region name).
- Determine the lowest level of summary in a fact table(sales dollar).

**Example of a Fact Table with an Additive Measure In Star Schema: Figure 1.6**



In the example figure 1.6, sales fact table is connected to dimensions location, product, time and organization. Measure "Sales Dollar" in sales fact table can be added across all dimensions independently or in a combined manner which is explained below.

- Sales Dollar value for a particular product
- Sales Dollar value for a product in a location
- Sales Dollar value for a product in a year within a location
- Sales Dollar value for a product in a year within a location sold or serviced by an employee

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